PERSONAL HYDRATION SYSTEM WITH PUMP

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 60/409,278 filed September 6, 2002.

FIELD OF THE INVENTION

[0002] The present invention relates to personal hydration systems and, in particular, to personal hydration systems that deliver fluids from a reservoir to a user through a drinking tube.

BACKGROUND OF THE INVENTION

[0003] Personal hydration systems provide a convenient way of supplying fluids. Since many of these systems are used to provide hydration during exercise, there has been much interest in hydration systems that minimize the amount of effort and disruption required to obtain fluids and to provide sufficient amounts of fluids. Among the hydration systems having improved fluid delivery capabilities are those systems that include a powered pump and those that do not include a pump ("pump-less" systems).

[0004] Pump-less systems operate under the action of a user drawing fluid from the reservoir, with or without the assistance of gravity. These systems have recently been improved by incorporating larger tubes, simpler spouts for filling, and leak-proof reservoirs. A prior art pump-less hydration system **100** for holding and delivering a fluid **113** is illustrated in FIG. 1. System **100** includes a reservoir **110** with a filling spout **111** and an exit port **112**. Exit port **112** is connected to a drinking tube **120**, which in turn is connected to a mouthpiece **130**. The user fills reservoir **110** with a desired amount of fluid **113**, and closes filling spout **111** to seal the reservoir. From the user's perspective, the operation of system **100** is similar to drinking through a straw. The user inhales sucks on mouthpiece **130** to draw fluid **113** from reservoir **110** into the user's mouth. The rate at which fluid is supplied to the user depends on the amount of suction and the fluid

resistance through the system. While this is a simple process, it can be taxing, especially if the user is already exerting significant energy and having to breathe hard while exercising. In addition, the use of pump-less systems requires one to hold their breath for a significant period of time for each drink.

[0005] Recent improvements have been made to hydration systems. As described in U.S. Patent Nos. 5,571,260 and 5,645,404, pumps can provide fluid to a user's mouth while eliminating the need to suck. While these systems require less time to obtain a drink, they require the use of the user's hands, and are thus of limited use while exercising.

[0006] FIG. 2A and 2B depict another prior art hydration system **200** with a pump **240** fluidly connected to a drinking tube **220** and near the top of a reservoir **210**. A switch **242** located near the mouthpiece **230** can be activated by a hand manipulating the tube. Batteries **241** are situated near the pump **240**. System **100** includes a carrying device **270**.

[0007] These pump systems, however, have several limitations. First, these aforementioned systems require the pump to come in contact with the liquid. As a result, the pump has to be cleaned after every use to keep it sanitary.

[0008] The prior pump-enhanced systems also require a hand to switch the pump on. This is may be a problem for user during physical exertion, or when the user's hands are otherwise occupied.

[0009] What is needed is an improved hydration system. Such a system should be easy to clean and maintain, should provide sufficient quantities of fluid to the user on demand, and should preferably be able to supply fluids without the use of the hands.

SUMMARY OF THE INVENTION

[0010] The present invention solves the above-identified problems of hydration systems by providing a system having a peristaltic pump actuated by the contact of the user's lips on the fluid supply tube.

[0011] The current invention includes a fluid reservoir, a drinking tube and a pump for propelling the fluid from the reservoir to a user's mouth. In one embodiment, the pump is activated when the lips of the user complete an electronic circuit. In another embodiment, the pump is activated when the lips cause a contact switch to close, completing a circuit for powering the pump.

[0012] The present invention provides an external, peristaltic device that clamps on to the tube, and propels the liquid by squeezing. The pump does not come in contact with the fluid, eliminating the need to clean the pump. The pump may be driven by an electric, mechanical, or electro-mechanical motor that is, preferably, activated electronically.

[0013] One aspect of the present invention provides a personal hydration system to facilitate the delivery of fluid from a reservoir, through a tube, to an open end of said tube. The system includes a pump having a mouth-actuated switch and attached to said tube to provide, when said switch is mouth-activated, a flow of fluid to said user. In one embodiment, the mouth-actuated switch includes a sensor responsive to an action of said user's mouth at said open end, and an electrical circuit operably connected to said sensor to provide power to said pump.

[0014] Another aspect of the present invention provides a personal hydration system to facilitate the delivery of fluid from a reservoir, through a tube, to an open end of said tube, where the system comprises a bendable support attached to said tube.

[0015] It is one advantage of the present invention to provide hands-free drinking without having to hold one's breath while sucking.

[0016] It is another advantage of the present invention to provide a pump that does not contact the drinking fluid.

[0017] It is another advantage of the present invention to provide a pump that can be retrofitted onto prior art "pump-less" systems.

[0018] A further understanding of the invention can be had from the detailed discussion of the specific embodiment below. For purposes of clarity, this discussion refers to devices, methods, and concepts in terms of specific examples. However, the advantages of the present invention may be realized using a variety of pumps, reservoirs, and delivery tubes. It is therefore intended that the invention not be limited by the discussion of specific embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Additional advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

[0020] FIG. 1 is a perspective view of a prior art pump-less hydration system;

[0021] FIGS. 2A and 2B is a perspective view of a prior art pump enhanced system;

[0022] FIG. 3 is a perspective view of one embodiment of the present invention showing a hands-free, peristaltic pump system;

[0023] FIG. 4 is a side view of the embodiment of FIG. 3 as the mouthpiece is placed in the users' mouth;

[0024] FIG. 5 is a top view of the embodiment of FIG. 3; and

[0025] FIG. 6 is a circuit diagram of the embodiment of FIG. 3.

DETAILED DESCRIPTION OF THE INVENTION

[0026] Exemplary embodiments are described herein with reference to specific configurations. Those skilled in the art will appreciate that various changes and modifications can be made to the exemplary embodiments while remaining within the scope of the invention. The present invention will now be described in more detail with reference to the Figures.

[0027] An embodiment of the present invention is described in relation to FIGS. 3 - 6. FIG 3 is an illustration of a personal hydration system **300** that includes a pump **340** that can be activated without needing to use a hand to manipulate a switch. The system includes a reservoir **310** having a fill spout **311**, and a drinking tube **320** connected to the reservoir through an exit port **312** located near the reservoir base. The other, open end of tube **320** includes a mouthpiece **330** for dispensing fluid. System **300** also includes a device for delivering fluid to the user, including a pump **340** attached to tube **320**, a mouth-actuated sensor **345** on mouthpiece **330**, wires **343** having ends **341** on the mouthpiece and leading from the sensor to a circuit **370**, and batteries **350**.

[0028] Details of one embodiment of mouthpiece **330** are shown in the side view of FIG. 4 and the top view of FIG. 5. In the embodiment of FIGS. 4 -5, mouthpiece **330** is flared at the end that dispenses fluid, providing a preferred orientation for placing in the mouth of a user **M**. The mouthpiece is an open tube, or alternatively is a bite valve. The elongated cross section of mouthpiece **330** has a preferred location for placing the lips when a drink is desired, as shown by the dotted line **342** of FIG. 5.

[0029] Drinking tube **320** is connected to the reservoir **310** near the pump **340** at the exit port of the reservoir, to allowing the pump to be primed by gravity when the reservoir is holding liquid. Pump **340** is controlled by circuit **370**, which is connected to mouthpiece **330** through wires **343**, and powered by batteries **350**. More specifically, circuit **370** is actuated by the action of the user's lips on a mouth-actuated sensor **345**.

[0030] Sensor **345** includes wire ends **314** that located on mouthpiece **330** that are connected to circuit **370** by wires **343** along tube **320**. Circuit **370** is responsive to a mouth-actuated action, preferably the touching of the user's lips, on sensor **345**, which provides switches power to pump **340** when actuated. The actuated pump **340** draws fluid out of reservoir **310** and forces the liquid through tube **320** to mouthpiece **330** for consumption by the user.

[0031] The inventive personal hydration system shown in FIG. 3 uses a touch sensitive sensor **345** on mouthpiece **330** and a circuit **370** to actuate the pump. In one embodiment, sensor **345** is actuated by as a result of the resistance change across the ends

of wires **341** on mouthpiece **330**. Specifically, the user's touching of the ends of wires **341** results in resistance change between the wires that is sensed by a circuit which then that powers pump **340** with batteries **350**. For example, the user contacts the end of wires **341** with the user's lips to actuate the pump.

[0032] One such actuating circuit **370** is illustrated in U.S. Patent No. 3,944,843 to Vaz Martins (the "Vaz Martins patent"), incorporated herein by reference. In the Van Martins patent, a circuit is provided that senses the resistance between the wire ends. The circuit is bistable, and responds to the resistance across the wire ends. When the resistance drops from high value when the ends are not contacted by the user to a lower value corresponding to the resistance across the contact surface, the state of the circuit changes. This change of state can be further sensed by a conventional circuit that causes power from batteries to be coupled to the pump.

[0033] Sensor **345** and circuit **370** are illustrated in FIGS. 5 and 6. Wire ends **342** of FIG. 5 are shown leading to circuit **370** as wires **A** and **B**. Wires **A** and **B** are connected to circuit **370** are shown in FIG. 6. Circuit **370** is the circuit described in the Vaz Martins patent, including a voltage **+V**, delivered by batteries **350**, resistors **R1**, **R2**, and **R3**, as shown in FIG. 3 of the Vaz Martin patent, transistors **T1** and **T2**, (element 10 and 11 in FIG. 3 of the Vaz Martin patent), and a bistable circuit **C** (element 12 in FIG. 3 of the Vaz Martin patent). Circuit **370** produces a switching signal **S**, that is connected to pump **340**, and that is responsive to resistance changes at wire ends **342**. In particular, a decrease in the resistance at wire ends **342**, due for example to lips **L** touching the ends, provides a signal **S** that further provides power to pump **340** using circuits known in the art.

[0034] An alternative circuits **370** for actuating the pump are within the scope of this patent. One such circuit is described in U.S. Patent 3,879,618 to Larson, and incorporated herein by reference, which is a more sophisticated version of the circuit of the Vaz Martins patent. The circuit of the Larson patent requires three wires, and improves the operation and reliability of the circuit of the Vaz Martins patent by eliminating leakage current across the wire ends. Circuits for actuating the inventive

pump would be obvious to one skilled in the art after consideration of the disclosure of the present patent application. In addition, it would likewise be obvious to use other actuating means, such as switches or multiple actuators on the mouthpiece.

[0035] FIG. 3 also depicts one example of a support mechanism **360**. Support mechanism **360** includes an additional, thicker wire **361** that travels along the drinking tube. This wire is malleable enough to be bent easily, but resilient enough to hold its shape while holding the drinking tube **320** in the desired location. This support mechanism would likely also include a way to anchor the wire and drinking tube to the body of the user. A clip **361** is illustrated to represent an example of such an anchor. Wires **341**, support wire **361**, and drinking tube **320** can be located inside a cloth sleeve.

[0036] In FIG. 3, the pump is shown to be a rotary-style peristaltic pump **340**. This style pump clamps on to the drinking tube **320** and squeezes the tube in order to draw and push the liquid from the reservoir to the mouthpiece of the user. Pump **340** includes rollers **342** attached to the end of spinning cams **343** that squeeze the tube. Pump **340** is powered by a mechanical device such as a coiled spring **344**, or is alternatively powered by an electric motor, or a combination of a mechanical device and an electric motor. Since most of the energy is used by the pump, mechanical powering provides the advantage of avoiding the need for large batteries or frequent battery charging. Other types of peristaltic pumps could also be used. Alternatively, other types of pumps are known in the art that can be used in place of the peristaltic pump.

[0037] Having disclosed exemplary embodiments, modifications and variations may be made to the disclosed embodiments while remaining within the scope of the invention as described by the following claims.